Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

8652224751

ADDITIONAL MATHEMATICS **0606/21**

Paper 2 **May/June 2014**

2 hours

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** the questions.
Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place in the case of angles in degrees, unless a different level of accuracy is specified in the question.
The use of an electronic calculator is expected, where appropriate.
You are reminded of the need for clear presentation in your answers.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total number of marks for this paper is 80.

This document consists of **15** printed pages and **1** blank page.

DC (RW/SW) 73390/3

CAMBRIDGE International Examinations

Mathematical Formulae

1. ALGEBRA

Quadratic Equation

For the equation $ax^2 + bx + c = 0$,

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Binomial Theorem

$$(a + b)^n = a^n + \binom{n}{1}a^{n-1}\,b + \binom{n}{2}a^{n-2}\,b^2 + \ldots + \binom{n}{r}a^{n-r}\,b^r + \ldots + b^n,$$

where n is a positive integer and $\binom{n}{r} = \frac{n!}{(n-r)!r!}$

2. TRIGONOMETRY

Identities

$$\sin^2 A + \cos^2 A = 1$$

$$\sec^2 A = 1 + \tan^2 A$$

$$\operatorname{cosec}^2 A = 1 + \cot^2 A$$

Formulae for ΔABC

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc\cos A$$

$$\Delta = \frac{1}{2}bc\sin A$$

1 Find the set of values of x for which $x(x+2) < x$. [3]

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2 **Without using a calculator**, express $6(1+\sqrt{3})^{-2}$ in the form $a + b\sqrt{3}$, where a and b are integers to be found. [4]

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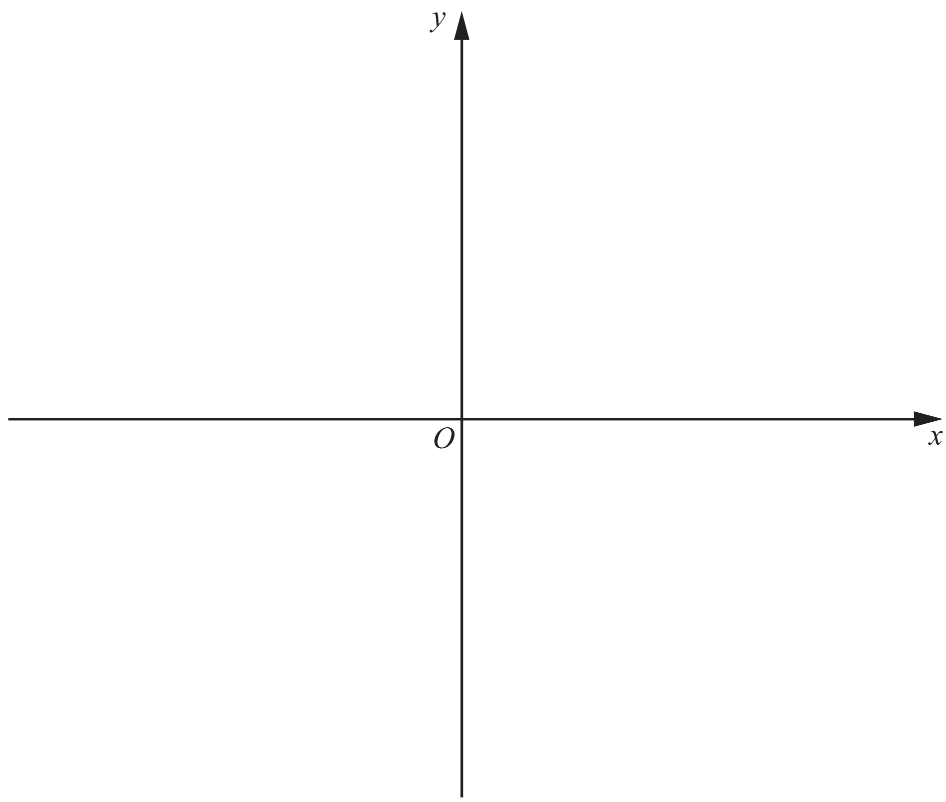
3 **(i)** On the axes below, sketch the graph of $y = |(x-4)(x+2)|$ showing the coordinates of the points where the curve meets the x-axis. [2]



(ii) Find the set of values of k for which $|(x-4)(x+2)| = k$ has four solutions. [3]

4 The expression $2x^3 + ax^2 + bx + 12$ has a factor $x - 4$ and leaves a remainder of -12 when divided by $x - 1$. Find the value of each of the constants a and b. [5]

5 **(i)** Express $2x^2 - x + 6$ in the form $p(x-q)^2 + r$, where p, q and r are constants to be found. [3]

(ii) Hence state the least value of $2x^2 - x + 6$ and the value of x at which this occurs. [2]

6 **(a)** Find the coefficient of x^5 in the expansion of $(3-2x)^8$. [2]

(b) **(i)** Write down the first three terms in the expansion of $(1+2x)^6$ in ascending powers of x. [2]

(ii) In the expansion of $(1+ax)(1+2x)^6$, the coefficient of x^2 is 1.5 times the coefficient of x. Find the value of the constant a. [4]

7 Given that a curve has equation $y = \dfrac{1}{x} + 2\sqrt{x}$, where $x > 0$, find

(i) $\dfrac{dy}{dx}$, [2]

(ii) $\dfrac{d^2y}{dx^2}$. [2]

Hence, or otherwise, find

(iii) the coordinates and nature of the stationary point of the curve. [4]

8 A sector of a circle of radius r cm has an angle of θ radians, where $\theta < \pi$. The perimeter of the sector is 30 cm.

(i) Show that the area, A cm^2, of the sector is given by $A = 15r - r^2$. [3]

(ii) Given that r can vary, find the maximum area of the sector. [3]

9 Solutions to this question by accurate drawing will not be accepted.

The points $A(p, 1)$, $B(1, 6)$, $C(4, q)$ and $D(5, 4)$, where p and q are constants, are the vertices of a kite $ABCD$. The diagonals of the kite, AC and BD, intersect at the point E. The line AC is the perpendicular bisector of BD. Find

(i) the coordinates of E, [2]

(ii) the equation of the diagonal AC, [3]

(iii) the area of the kite *ABCD*. [3]

10 Find $\frac{\mathrm{d}y}{\mathrm{d}x}$ when

(i) $y = \cos 2x \sin\left(\frac{x}{3}\right)$, [4]

(ii) $y = \frac{\tan x}{1 + \ln x}$. [4]

11 **(a)** Solve $2^{x^2-5x}=\frac{1}{64}$. [4]

(b) By changing the base of $\log_{2a}4$, express $(\log_{2a}4)(1+\log_a 2)$ as a single logarithm to base a. [4]

12 The functions f and g are defined by

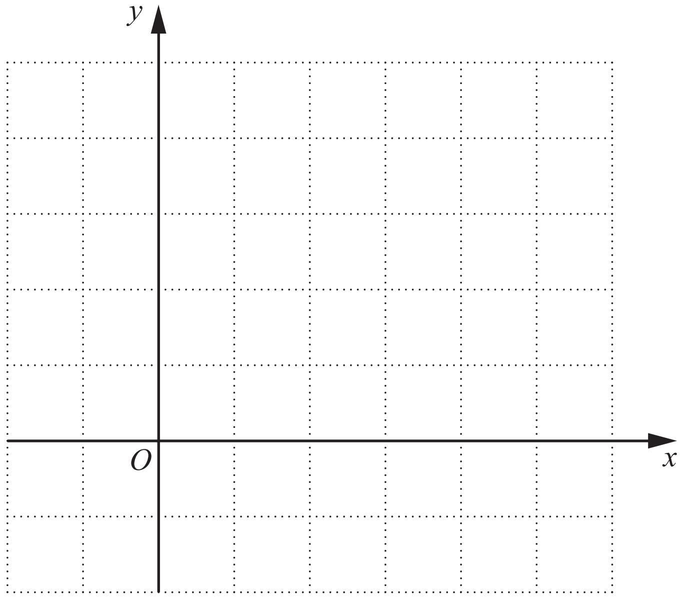
$$f(x) = \frac{2x}{x+1} \text{ for } x > 0,$$
$$g(x) = \sqrt{x+1} \text{ for } x > -1.$$

(i) Find $fg(8)$. [2]

(ii) Find an expression for $f^2(x)$, giving your answer in the form $\frac{ax}{bx+c}$, where a, b and c are integers to be found. [3]

(iii) Find an expression for $g^{-1}(x)$, stating its domain and range. [4]

(iv) On the same axes, sketch the graphs of $y = g(x)$ and $y = g^{-1}(x)$, indicating the geometrical relationship between the graphs. [3]



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